To Promote Sharing and Re-use of Digital Learning Materials in Higher Education: A NIME New Project

Tsuneo Yamada
National Institute of Multimedia Education, Japan

Abstract

In Japanese higher education, accumulation and utilization of high-quality digital learning materials is one of the essential requirements for the progress of educational reform using Information Technology (IT). Some infrastructure and social agreements for exchanging and reusing digital learning materials are indispensable for their sustainable development and utilization. The concept of "Learning Object (LO)" is one of the possible solutions. LO gave materials several new important characteristics. To share and re-use, they had a meta-data system and were based on various international standards, such as XML, SCORM and LOM.

In FY 2001, NIME launched a new project, "R&D on Advanced Digital Learning Resources in Global Quality Standards and Strategies for their International Distribution." Except the possibility that we develop entirely new LOs, one of the realistic solutions for the accumulation is to reuse learning materials developed in the past. In order to examine various issues when we transfer the content of packaged materials, such as CD-ROM, into Web-based e-learning materials, that is, LOs, the project is constructing "NIME Experimental Site for sharing and re-use digital learning objects". Its current main content is the materials for teacher education and Japanese language education. In this site, various issues, such as granularity, copyright and intellectual property issues, meta-data system, compatibility in the medium/platform transfer, quality assurance, and standardization and localization, will be analyzed;.

Backgrounds

With the progress of educational reform and educational use of IT, the needs for high-quality digital learning materials have drastically increased in Japanese educational institutions. In various academic areas and fields, their development is promoted by institutions or faculties. Recent trends of learning paradigms are learner-centered approach, autonomous learning, life-long learning, distance education and internationalization. They bring new learners, who have various backgrounds and achievement levels, and new learning environments, which should be flexible and tailor-made for each learner. As a result, both learners and teachers need more variable and more flexible materials. However, the fulfillment is a difficult goal for many institutions, which have the limited financial, and/or hu-

man resources.

Comparing with K-12 education, in higher education, the number of subjects and academic fields is much more and most of them have neither standard curricula nor innovative pedagogical strategies. In addition, many Japanese faculties hesitate to depend on the textbook or courseware which are not their own, and have strong needs for "material-oriented, component-based" learning materials (Note 2; Yamada, 1997).

1) Learning Objects

In North America, Europe and Australia, the consortia for co-developing and sharing digital learning materials have been organized among universities and other educational sectors, and they have constructed gateways and repositories for learning materials on the WWW. Collaboration between such repositories or consortia has been already initiated.

The common image of sharable learning materials that such consortia and repositories can have is "learning object (LO)". The definition of LO has not been fixed yet. For example, that of the Institute of Electrical and Electronic Engineers (IEEE) is "any entity, digital or non digital, that can be used for learning, education or training". However, many other definitions contain the common characteristics as follows;

(1) LOs are digital learning materials on the WWW.
(2) LOs are sharable and reusable.
(3) By preparing adequate and/or multiple levels of granularity, LOs can decrease their context-dependency.
(4) Each LO has metadata.、

In Japan, some infrastructure and social agreements for sharing and reusing digital learning materials are indispensable for their sustainable development and utilization.

2) "R&D on Advanced Digital Learning Resources in Global Quality Standards and Strategies for their International Distribution": A NIME Project:

NIME is a governmental institute for inter-university collaboration. Our objective is to support Japanese and overseas higher educational institutions in the context of the educational reform using IT. In FY 2001, NIME launched a new project, called "R&D on Advanced Digital Learning Resources in Global Quality Standards and Strategies for their International Distribution." In the project, we (1) study on the characteristics, designs and quality assurance of digital learning materials (that is, "learning objects"), and the strategies for their standardization and localization, (2) develop various prototypes of advanced digital learning materials in global standards, in which the latest technologies are also utilized, (3) develop the support systems and tools for developing digital learning materials,

and (4) clarify strategies to promote accumulation, distribution, utilization of digital contents such as digital archive, information portal, database, repository, copyright processing support system and their international standards (Figure 1, the annual plan; Figure 2: the final products of the project). Twelve professors and more than fifty visiting researchers (most of them are professors or researchers in other universities or public/private research institutes) are participating in this project.

In the project, in order to identify common strategies for exchanging and sharing LOs developed by higher educational institutions in different countries, we have domestic and international surveys every year and are analyzing what are major issues.

In addition, we developed (1) various prototypes of learning materials, (2) support tools for the development and evaluation of learning materials and (3) sub-systems for sharing and co-use of learning materials, such as "Streaming Movie Editing Tool", "LOM Authoring Tools", "Copyright Clearance System", "Educational Knowledge Management System" and "WWW Content Evaluation Support System (REAS)".

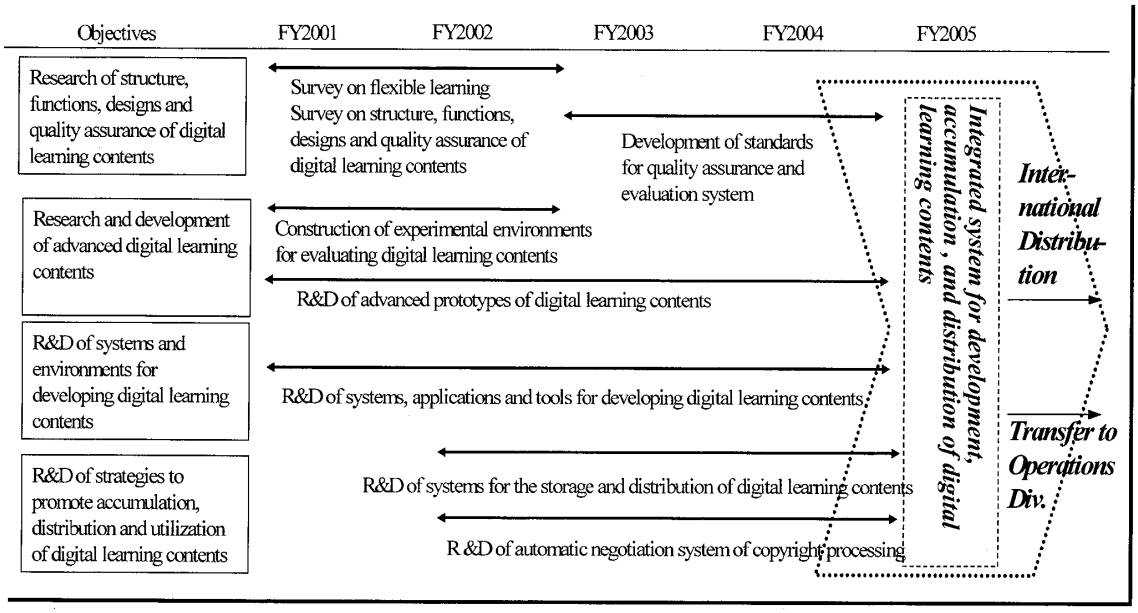

Figure 1 A NIME Project for "R&D on Advanced Digital Learning Resources in Global Quality Standards and Strategies for their International Distribution": Annual Plan

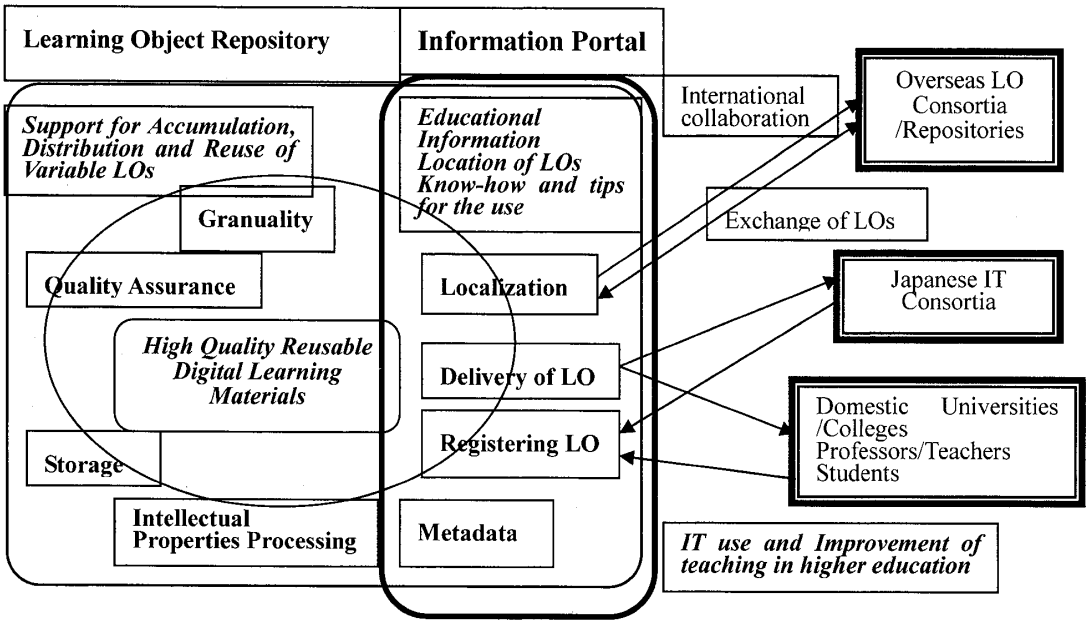

Figure 2 A NIME Project for "R&D on Advanced Digital Learning Resources in Global Quality Standards and Strategies for their International Distribution": Final goals

"NIME Experimental Site for sharing and re-use digital learning objects"

1) Objectives:

Except the possibility that we develop original learning objects, one of the realistic solutions for the accumulation is to reuse instructional materials developed in the past. In order to examine various issues when we transfer the content of packaged materials, such as CD-ROM, into Web-based e-learning materials, that is, "learning objects"; we launched "NIME Experimental Site for sharing and re-use digital learning objects" (Figure 3).

In this site, various issues, such as granularity, copyright and intellectual property issues, meta-data, compatibility in the medium/platform transfer, quality assurance, and standardization and local-ization, were analyzed.

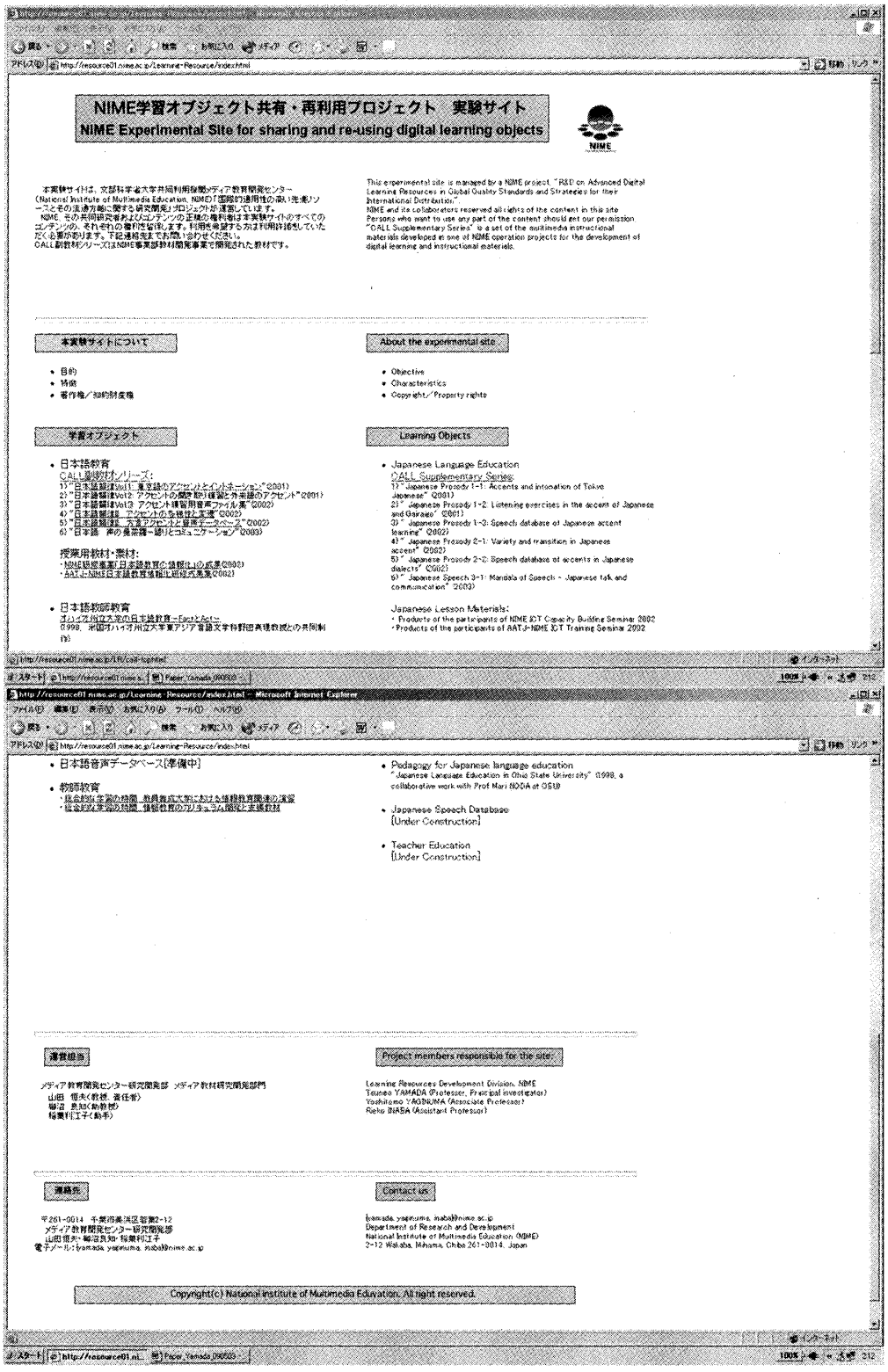

Figure 3　Top page of “NIME Experimental Site for sharing and re-use digital learning objects”

2) Characteristics:

Learning objects on the site are (1) material-oriented / component-oriented, (2) global standards-oriented, (3) multilingual / multicultural-oriented and should have (4) high-quality. The main sources of materials are the reuse of instructional materials developed by NIME or that of the outcomes of seminars or workshops held at NIME.

The content at the experimental site was limited to the area of foreign language learning (especially, Japanese language education) and that of teacher education (especially, information literacy education or use of IT in the classroom) at the first stage.

3) The content of materials (Table 1)

Table 1 The content of "NIME Experimental Site for sharing and re-use digital learning objects" (tentative)

	Total Size	Number of Files
Japanese Language Education		
Japanese Prosody: Accents and intonation of Tokyo Japanese	311MB	14×22Languages= 308 Audio Files
Japanese Prosody: Variety and transition in Japanese accent	185.6MB	350 Audio Files
Japanese Prosody: Speech database of accents in Japanese dialects	205.2MB	415 Audio Files
Japanese Lesson Materials		
Products of the participants of NIME ICT Capacity Building Seminar 2002	61.9MB	10 Movie Files
Products of the participants of AATJ-NIME ICT Training Seminar 2002	34.01GB	12 projects 158 images, 119 Movie Files, 12PPT
Pedagogy for Japanese Language Education		
Japanese Language Education in Ohio State University	1.06GB	36 Movie Files
Teacher Education for "Hours for Integrative Studies"		
Practices for Informatics and IT literacy in Teachers' Colleges	602MB	29 Audio Files 30 Movie Files
Development of Curriculum and learning materials for Informatics and IT literacy	588.2 MB	15 Audio Files 16 Movie Files

(1) Japanese language education

"Japanese Prosody" series consisted of three CD-ROMs on Tokyo dialect and two CD-ROMs on other dialects.

In CD-ROM materials "Japanese Prosody 1-1: Accents and intonation of Tokyo Japanese (2001)", the accents and intonation of Japanese Tokyo Dialect are explained in twenty-two languages. Learners can acquire the knowledge on them efficiently by choosing the native or the most familiar language. In addition, each sample sound was recorded by three male and three female native speakers of Tokyo dialect. Learners can compare the differences between genders or among individuals.

CD-ROM materials "Japanese Prosody 1-2: Listening exercises in the accent of Japanese and Gairaigo" (2001) contained two types of interactive training tasks; Forced-choice tasks to identify one of the accent types of the Japanese speech and Tutorials with Quiz on the Japanese accent rules. Japanese words and Gairaigo (loanwords) were used as training sounds.

In CD-ROM materials "Japanese Prosody 2-1: Variety and transition in Japanese accent" (2002), the characteristics of Japanese accents in various dialects are explained in Japanese. The materials can be used not only in the Japanese as Second Language (JSL) class of the most advanced level but also in the class of phonetics and linguistics for the native speakers of Japanese. It consisted of a tutorial and six practices on the geographical and historical variation of Japanese accents.

In addition, the sounds used in the tutorials and drills (more than 1800 words in Tokyo dialect and utterances in sixty points nationwide) were also recorded as speech database.

All of the content of five CD-ROM materials were transformed and transferred on the WWW.

(2) Japanese Lesson Materials

NIME and its collaborators have developed various training courses and workshops for building capacities to produce, share and utilize learning objects. Through such FD (Faculty Development) or SD (Staff Development) programs, participants were trained to be leading providers of high quality learning objects in each institution.

In FY2002, NIME had a joint workshop for Japanese language teachers under the collaboration with Alliance of Associations of Teachers of Japanese (AATJ) in the United States.

AATJ and NIME had similar backgrounds. In recent years, we had the reforms of the standards or national curricula; Not only the views and methodologies for education and learning but also teaching facilities and instruments changed; Some advanced teachers had challenged to develop by themselves the materials which they can use in their classrooms.

AATJ could prepare six-week training institute for their participants. As it was difficult for Japanese teachers in Japan to participate in such a long-term seminar, we reconstructed as a five-day semi-

nar and shared with AATJ participants. Both participants divided into several mixed groups of 3-4. As a team, they developed learning scenario (teaching plan), took video using "Sony DV Cam", edited them using "Adobe Premiere", developed some additional digital materials using "Microsoft PowerPoint" and so on, put them on the "WebCT", a course management system, and held simulated teaching. Their typical products were a set of materials which they can use in their 1-2 lessons and consisted of a teaching scenario (or teaching plan), video/audio/photos, and supplementary materials for students' activities and mini-tests.

4) Issues in the construction stage of the site

(1) Granularity of Learning Objects

In order to investigate what level of granularity is adequate in each user's purpose, materials were separated into parts or components and stored. Users can access to the content as a whole of courseware, as a component or unit on each topic/task or as a part or material such an image or audio files. It is also an important point how did users change or transform the original objects at his/her utilization.

(2) Copyright and intellectual property issues

In these 3-5 years, when we gave orders to productions or software companies, it was one of our requirements to get permission from authors for the use in the WWW even if they were packaged-medium instructional materials, such as CD-ROMs. In the project, we evaluated such past efforts. On the copyright issue, we had difficulties on the parts in which professional actors/actresses played or on those we used sources secondarily. In such cases, they were very careful to give permission on the delivery from WWW and requested us to use the secured system for user identification.

(3) Meta-data system

The meta-data system used in the site is identical to that of NIME Information Portal managed by Operations Department of NIME. It is based on IEEE-LOM and compatible with that of "NICER (National Information Center for Educational Resources, Japan) Information Portal". For tagging a meta-data, LOM authoring tools, which were originally developed for "NIME Information Portal", are used. In this project, it is examined whether the meta-data system is applicable to a LO repository. Generally speaking, parameters on goals of materials, typical usage, characteristics of target learners, and rights/copyright and other restrictions are necessary.

(4) Compatibility in the medium/platform transfer

On the transfer, the parts authored by "Macromedia Director" had some difficulties. In Japan, "Director" has been often used in the development of CD-ROM materials for sale. We need standardized format for authoring, such as SCORM, although we have difficulties when design more sophisticated structure with the current version of SCORM.

5) The next step

(1) A large-scale evaluation study

After we have accumulated the minimum volume of learning objects, we plan to start a large-scale evaluation study. For the plan, we are investigating the methodologies, that is, looking for potential collaborators and developing the evaluation tools on the WWW.

(2) Organizing participation of collaborators

In 2002, NIME organized a consortium of consortia, that is, a meta-consortia to find out solutions cooperatively for common issues among member consortia (The current member consortia, Table 2). All of members focus on e-learning and improvements of higher education by IT use. One of their main issues is to promote sharing and co-use of learning materials. Some essential functions of NIME information portal and repository, such as quality evaluation, cannot be realized without participation of professionals and faculties, that is, member consortia.

Table 2 The current member consortia of "the Consortium for Supports to IT education" (a meta-consortium) Some of the English names of the consortia are not official.

Member Consortium	The main mission & Levels	Participating Institutions
Consortium of Technical Universities for Collaborative Education	Sharing *courses* in master program	Technical Universities(more than 10)
Consortium for VU of universities and industries	Sharing *courses* sponsored by Japanese E&B Foundation-Business and Technology	Waseda Univ, Keio Univ, Kyoto Univ.
Consortium of Veterinary Colleges	Sharing *learning materials* on Animal Pathology	Veterinary Colleges
Consortium of the four universities for Collaborative Education	Sharing courses in distance education	Four National Universities in Western Tokyo Area
Consortium of Educational Information and Computing Centers in National Universities (OBSERVER)	Sharing *learning materials* (Information, Information Literacy)	Twelve National Universities (Hokkaido Univ., Muroran Inst. of Tech., Tohoku Univ., Univ. of Tokyo, Nagoya Univ., Nagoya Inst. of Tech., Kyoto Univ., Osaka Univ., Wakayama Univ., Hiroshima Univ., Kyushu Univ., Kyushu Inst. of Tech.)

(3) Quality assurance

When the content of the site increases and especially when various providers register their materials, some quality assurance system will be indispensable. While develop the standards of quality evaluation or support tools for the evaluation on WWW, we are studying the peer-review system for the materials.

(4) Global Standardization and localization

Some overseas repositories examine the necessities of localization on language and culture. In the formal aspects, global standards on metadata, content or structure of materials, such as LOM, XML, SCORM, are undoubtedly effective. However, at least in some areas or fields, such as local economics or law, localization is indispensable. In our site, issues in importing overseas materials and those in exporting Japanese materials should be analyzed under the collaboration with overseas partner institutions and researchers.

A Prospect

Sharing and reusing learning objects should be understood in the more holistic viewpoint of knowledge-sharing in knowledge-based society. After the cooperation among various academic/research institutions and public/private sectors, it comes true. We should exchange ideas with domestic/overseas potential users to share common goals and frameworks.

Note

1) This paper is an outcome of a NIME project, "R&D on Advanced Digital Learning Resources in Global Quality Standards and Strategies for their International Distribution (Project Members: Tsuneo YAMADA, Makiko MIWA, Sanae AOKI, Hiroshi KATO, Akemi KAWAFUCHI, Haruo KODAMA, Tomotsugu KONDO, Yoshihiko OHTA, Junji SHIBASAKI, Yoshitomo YAGINUMA, and Rieko INABA)."
2) "Material-oriented, Component-type" instructional materials was the term to categorize the materials developed by NIME Instructional Materials Operation project. In the evaluation process of developed packaged-media materials and in the surveys on users' needs, we had known the following requests from users in higher educational institutions. Characteristics of materials that faculties want to use in his/her classroom were;
    (1) As structure of course is decided by each professor or teacher, instructional materials that can be used as components or materials are desirable.
    (2) The role of such materials is not a substitute of professor or teacher, but a support and assistance of his/her teaching
    (3) Ideally, secondary use of materials is permitted. Users can change, delete and reconstruct any part of them and develop their own course using them as "materials".
    (4) The user community will promote to fulfill the content drastically by sharing them
    (5) They should be independent to each delivery system or medium.

The concept of "Material-oriented, Component-type" instructional materials is similar to that of "Learning Objects". Recently, we also use "LO" instead of our term in order to share the philosophy and concept.